Draft

Lake Okeechobee Water Retention/Phosphorus Removal Project -

Nubbin Slough (New Palm) Stormwater Treatment Area (STA)

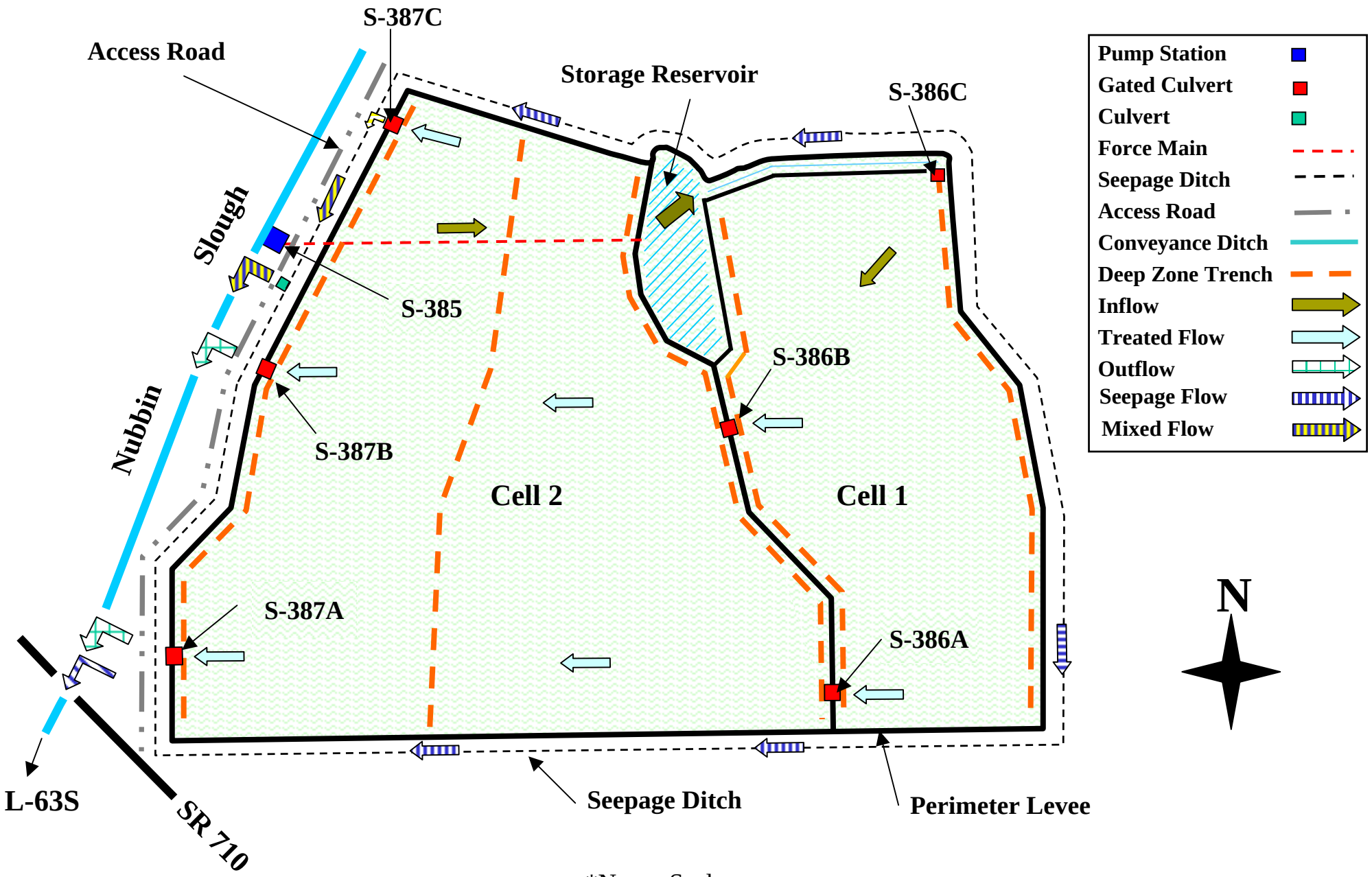
Water Control Plan

Table of Contents

Figure 1


Okeechobee
Stanley Consultants INC.
213
PROJECT LOCATION
Chandler Hammock Slough
Dixie Ranch Acres
TAYLOR CREEK SITE
214
Turkey Slough
248 and ARS 11
Basswood Estates
Whispering Pines
Okeechobee County
Popash Slough
Barber Quarters
Cypress Quarters
Okeechobee
241
NUBBIN SLOUGH SITE
252
Sherman
228
Popash Slough
Lemkin Creek
Eagle Bay
S191
LAKE OKEECHOBEE
N
214 WATER QUALITY MONITOR LOCATIONS
SCALE: 1 = 126720 (1" = 2 MILES)
Location Map

Figure 2 - Nubbin Slough STA Structures & Flow*



*Not to Scale

7.01 Introduction.

A. Water Control Plan Development. The main purpose of a water control plan is for day-to-day use in water control for essentially all foreseeable conditions affecting a project. Report preparation is pursuant to Engineering Regulation 1110-2-240, and is in accordance with guidance contained in Engineering Manual 1110-2-3600 and Engineering Regulation 1110-2-8156. The Startup Phase is initiated after the construction associated with the Nubbin Slough (New Palm) Stormwater Treatment Area (STA). During this phase water levels will be regulated to encourage vegetation establishment and to prevent discharge from treatment Cell 2 until the start-up criterion as identified in the Nubbin Slough STA Lake Okeechobee Protection Act (LOPA) Permit is met. This water control plan will be included as an appendix to the Lake Okeechobee Operating Manual. All elevations referenced in this draft water control plan are in feet, National Geodetic Vertical Datum, of 1929 (NGVD) unless otherwise stated.

B. Background. This project is one of the Critical Restoration Projects authorized by Section 528 of the Water Resources Development Act of 1996. A list of Critical Projects was proposed and then prioritized and ranked by the South Florida Ecosystem Restoration Working Group. The Governor's Commission recommended that priority be given to this phosphorus removal project that was ranked 10^{th} on the list of Critical Projects. The sponsor for the project is the South Florida Water Management District. (SFWMD)

7.02. General Objectives.

The goals of the Nubbin Slough STA are to reduce the mass and concentration of Total Phosphorus (TP) in the Nubbin Slough basin stormwater. High TP loads have been implicated in excessive eutrophication of Lake Okeechobee that can result in algal blooms, high sediment oxygen demand, and loss of fisheries and recreational benefits provided by the lake. The average phosphorus concentration in Nubbin Slough is approximately 620 ppb. STA vegetation grow-in will provide an initial storage for TP released from the newly flooded soils. Much of the TP initially

released from soils will be taken up by growing plants in their biomass. Some of the released TP will also be taken up by microbial populations that will colonize at the site under wetter conditions. In addition to the reduction of TP loads, the New Palm STA will provide additional water quality and quantity benefits during the dry season to downstream waters. The STA will provide an initial storage for TP initially released from soils which will be taken up by growing plants in their biomass. In addition, the STA will provide for the removal of suspended solids, dissolved and particulate oxygen-demanding materials, total nitrogen, heavy metals, and pesticides that would otherwise flow into the lake.

7.03. Project Description.

The Nubbin Slough STA is located at Nubbin Slough, approximately 6.5 miles southeast of the City of Okeechobee. The property totals 2,135 acres, or which 809 acres is committed to the STA. The remainder is occupied by forest or is preserved for future projects. The STA consists of two cells operated in series. The STA is designed to have a mean water depth of approximately 2 ft. and a maximum water depth of 4 ft.

7.04. Project Features.

Physical features for the Nubbin Slough STA include perimeter levees, separation levees, deep zone trenches, a 48-inch forcemain, 30-acre storage lagoon, inflow pump station 385 (S-385), ungated culvert, and gated culverts 386 and 387 structures (S-386, S-387). The S-385 may be operated at the from S127 Control Center or on site at the control building. Inflow to the STA will be determined by the manufacturer’s pump curves and head determined from water levels transmitted from sensors upstream of the pump station and at the discharge of the force main. Water stage Sensors and water quality sensors will be placed at the other STA structures. Please refer to Section 7.19 for additional STA monitoring detail.

A. Check Weir. This will be constructed in Nubbin Slough, upstream of S-385, in order to create a ponding area which will prevent frequent cycling on and off of the pumps. The weir is designed to pool water to elevation 20.0 ft. for the pump station, while passing high flows over a long sill to minimize backwater effects.

B. S-385. S-385 is a pump station located on the western side of Cell 2 between S-387C and B. The pump station consists of four parallel submersible, centrifugal pumps with a maximum capacity of 120 cubic feet per second (cfs). The pump capacities exceed the normal flow within Nubbin Slough and will be used to capture peak flows. The flows for S-385 are in Table 1. To prevent frequent pump cycling, a check weir will be constructed to create a ponding area at the intake of S-385. In addition, S-385 is constructed at a low enough elevation to allow a future connection to the L-63 canal, if that water becomes available for treatment.

S-385 will operate to maintain a water level in Nubbin Slough between 17.0 and 20.0 ft. (20.0 ft. is the overflow height for the check weir.)

Table 1.

No. of Pumps Running	**Approximate Flow Rate (cfs)**
1	35.7
2	69.1
3	95.8
4	120

The flow rates for S-385 pumps, shown in Table 1, were calculated using a static head of 19 ft. (pump maximum head allowed) (Design Analysis Final Submittal, June 2003, Stanley Consultants, Inc.)

C. Inflow force main. S-385 pumps into this 48-inch force main to the STA reservoir. The force main is underground and crosses over the northern portion of Cell 2.

D. STA Reservoir. S-385 force main will discharge to a 30-acre reservoir which will discharge to a conveyance ditch. S-386C will discharge to the conveyance ditch.

E. Conveyance Ditch. This located on the north east corner of the reservoir and north of Cell 1. The reservoir will discharge to the conveyance ditch.

F. Conveyance Ditch Discharge Culvert (S-386C) This structure is a 3 ft. diameter reinforced concrete pipe

culvert with a downward opening slide gate; the water will over flow the gate to the eastern deep zone trench in Cell 1. S-386C is located at the end of the conveyance ditch.

G. Interior Culverts S-386A & S-386B. Both S-386A & B are 3 ft. diameter reinforced concrete pipe culverts with a downward opening slide gates; the water will flow over the gates. These structures are located in the separation levee. The gates will be operated to maintain water depths in Cell 1 between 0.5 and 2.0 ft.

H. Outflow Culverts (S-387A,B, and C). S-387A, S-387B, and S-387C are each 3 ft diameter concrete pipe culverts with a downward opening slide gate; the water will flow over the gate. These culverts are located in the western levee The structures will be operated to maintain water depths in Cell 2 between 0.5 and 2.0 ft.

I. Levees. The STA is bounded on all sides by levees. The crest elevations for Cell 1 and 2 are 36.0 and 34.5 ft., respectively. A separation levee across the midsection of the site provides separation between east (Cell 1) and west (Cell 2). The total length of levees is set by the design pool elevation within each cell plus a freeboard allowance to accommodate the 10-year, 24-hour precipitation event, wind set-up, and wave run-up. The freeboard allowance for both cells is 3 ft., which consist of 8 inches for a 10-year 24-hour event, an estimated 4-inch surge, 1.5 ft. for wave run-up and 6 inches for backwater effects. The design pool elevation for Cells 1 and 2 is 32.2 and 30.5, respectively. The side slopes are 3H to 1V.

J. Deep Zone Trenches. Both Cell 1 and Cell 2 have an inflow, outflow, deep zone trenches. Cell 2 contains an intermediate deep zone trench. Deep zone trenches are located in the STA to improve the even distribution of flow throughout each cell. The trenches average 3 ft. in depth with a 10 ft. bottom width and 4H to 1V side slopes. Deep zone trenches at the inflow points of each cell distribute the flow over a wide area. Deep zone trenches at the outfall collect return flow over a wide area.

K. Emergency Overflow Sections. Each treatment cell contains an emergency overflow section for Cell 1 is located in the separation levee. Cell 1 water may overflow to Cell 2. The emergency overflow section for Cell 2 is

located in the western perimeter levee. Water may flow over the emergency overflow section from Cell 2 to the seepage ditch which will discharge through an gated culvert, located in the southwestern corner of the seepage ditch, to Nubbin slough.

7.05. Constraints.

A. Vegetation Removal. Each cell will be taken off-line when activities necessary for performance enhancement related to vegetation removal are occurring. The cell's inflow structure must be operated to reduce flow to the cell until the cell is back online.

B. Phosphorus Removal. Discharge from the Nubbin Slough STA will not begin until net improvement for phosphorus removal is observed. The 4-week geometric mean measured at the inflow site must be less than the 4-week geometric mean measured prior to discharge back to Nubbin Slough.

C. Availability of water to the STA. The operation of the New Palm STA is limited by the availability of water in Nubbin Slough. A check weir will be constructed to create a ponding area upstream of S-385 to prevent frequent pump cycling.

7.06. Overall Plan for Water Control.

S-385 will pump water from Nubbin Slough through a force main to the 30-acre reservoir near the upstream of Cell 1. The reservoir will discharge to the conveyance ditch. S-386C will be adjusted to allow flow to the Cell 1. The S-386A and S-386B will be set to allow flow over the gates to Cell 2. The Cell 2 flow will pass by gravity through the S-387 structures which will discharge to the seepage ditch. The seepage ditch will flow to an ungated culvert that will discharge to Nubbin Slough. This ungated culvert is located at the southwestern corner of the project area (west of S-387A).

A. Startup Phase Operations. The goal during STA startup is encouragement of wetland vegetation while minimizing release of dissolved and particulate Total Phosphorus (TP) downstream. The Startup Operations are

intended to avoid release of any water from the STA until surface water TP concentrations are equal to or below the concentration of TP in the STA inflow water as measured at S-385.

The S-387 structures will be closed during the STA startup. S-385 will begin pumping. S-386C will be opened to allow flow from the conveyance ditch to Cell 1. During periods of excessive rainfall, the inflow pumping will be reduced or stopped. S-386A and B will be adjusted to allow Cell 2 elevation to reach 33.0 ft. When the elevation in Cell 2 reaches 33.0 ft., S-386A and S-386B gates will be set at 34.5 ft. S-385 pumping will be reduced. Once net improvement for phosphorus removal is observed, at the water quality sampling sites upstream of S-387A, B and C, the slide gates will be adjusted to allow treated flow to Nubbin Slough. S-386A,B, and S-386C will be adjusted to maintain elevations of 32.2 ft. and 30.5 ft., in Cells 1 and 2, respectively. Normal operations, below, will begin.

B. Normal Operations. Normal operations are defined as operations up to and including the design peak flow pumping rate of 100 cfs. The S-386 structures and S-387 structures will be operated to provide a water depth between 0.5 and 2.0.in Cells 1 and 2, respectively. The average land elevation in Cell 1 is approximately 30.5ft and 28 ft in Cells 2. Considering these average land elevations, the stages in Cell 1 should range from 31 ft to 32.5 ft and 28.5 ft to 31.0 ft in Cell 2.

7.07. Flood Control. When the Nubbin Slough STA water elevation in Cell 1 is greater than 27.5 ft., S-385 will cease pumping. S-386A and B will be adjusted to allow flow over the gates. In addition, emergency overflows are located on the western levees for each cell to allow levee protection if S-386 or S-387 structures become plugged.

7.08 Pre-storm Drawdown. Pre-storm drawdowns may be based on National Weather Service Advisories and SFWMD forecasts. If storage in the STA can be created by discharging treated water to Nubbin Slough prior to the storm event, pre-storm drawdowns may be initiated. Pumping at S-385 will cease for pre-storm drawdown. S-386A and B may be operated to lower the water level within Cell 1 before a storm arrives and to improve the passage of water during a high rainfall event. S-387A, B and C will be open to make releases to Nubbin Slough.

7.11. Recreation. An airboat ramp is at the site; however, maintenance and monitoring personnel will mainly use the ramp. SFWMD intends to allow certain types of recreational use in the STA, and is in the process of preparing plans. However, there will not be specific operations to provide for recreation.

7.12. Water Quality. During the startup phase of the STA, water will not be released to Nubbin Slough until a net reduction measured at the interior sample site at S-387A ,B, and C is less than the 4-week geometric mean TP measured at the inflow site at S-385.

7.13. Seepage Control. The seepage ditch is located along the entire perimeter of the STA. The STA seepage will flow to the seepage ditch from which the seepage will discharge through ungated culverts located on the west side of the western portion of the seepage ditch to Nubbin Slough.

7.14. Fish and Wildlife. There are no operations specifically for fish and wildlife.

7.15. Water Supply. There are no operations specifically for water supply.

7.16. Drought Operations. Inflows to the STA will continue to the extent possible as water flows in the source stream begin to decline during the onset of a drought. When the Nubbin Slough elevation falls to 17.0 ft, S-385 will cease pumping. the S-386 structures will be adjusted as necessary so that Cell 1 water will be transferred to Cell 2. S-387 structures will operate as necessary to provide the two-foot water depth.

If during the drought period, the cells are out of service for an extended period and invasive upland vegetation is established, Startup Operations will be reinitiated.

7.17. Deviation from Normal Operation. The USACE, Jacksonville District, Engineer is occasionally requested to deviate from the normal regulation of the project. Prior approval for a deviation is to be obtained from the Jacksonville District Office (SAJ) except as noted below. The Jacksonville District Office will in turn obtain the necessary approvals from the South Atlantic Division (SAD) except as noted below. Deviation requests usually fall into the following categories:

A. Emergencies. Some emergencies that can be expected include drowning and other accidents, failure of project facilities, and flushing of pollutants. Antecedent conditions, as well as forecasted storm events, may result in SFWMD declaring an Emergency Authorization Order which would result in an Emergency Deviation. Necessary action under emergency conditions is taken immediately, unless such action would create an equal or worse condition. The Jacksonville District Office should be informed as soon as practicable. Written confirmation should be furnished after the incident. SAJ will report these deviations to SAD.

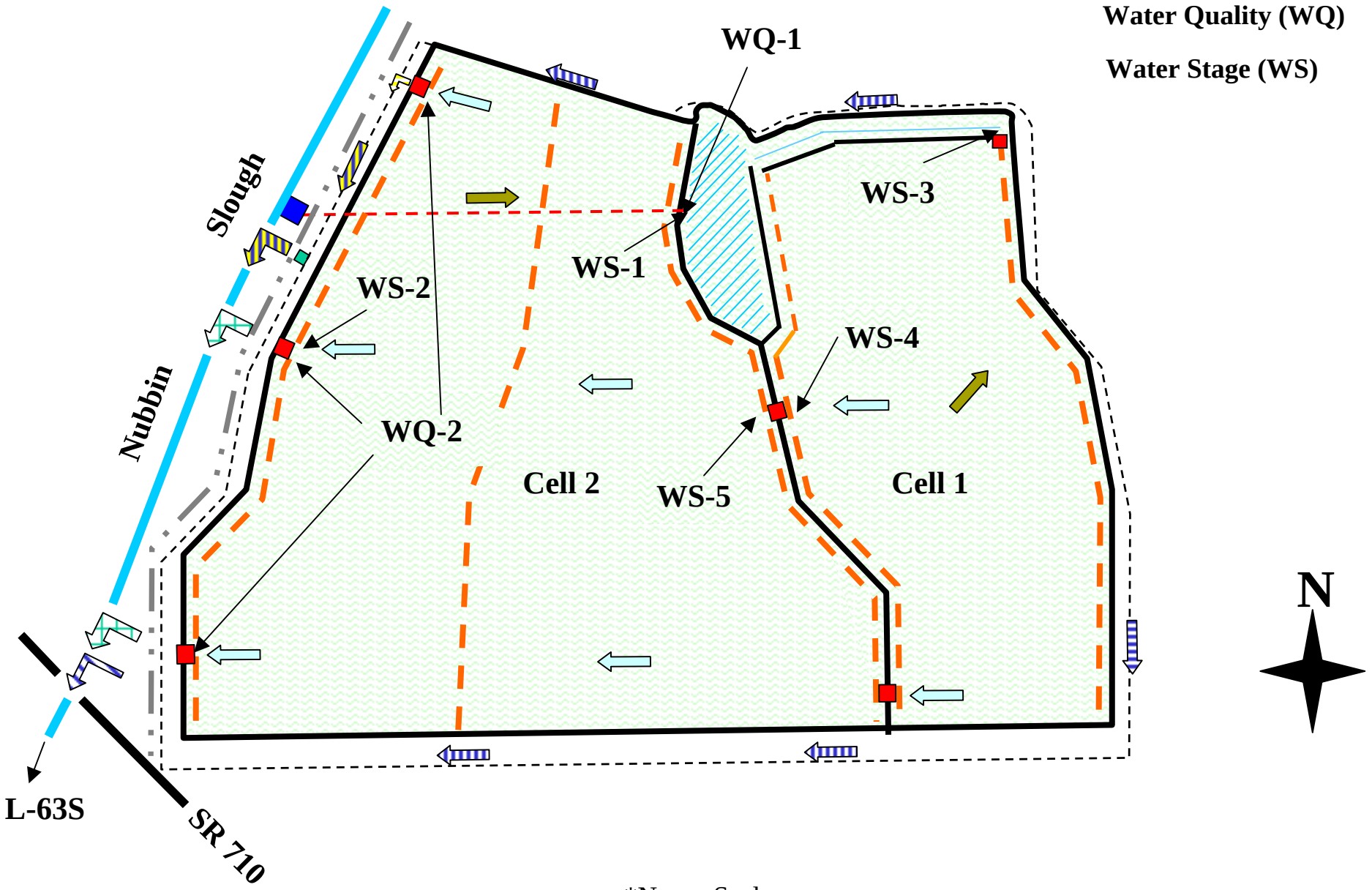
B. Unplanned Minor Deviations. There are unplanned instances where there is a temporary need for a minor deviation from normal regulation, although they are not considered emergencies. A change in releases is sometimes necessary for construction, maintenance, or inspection. These requested deviations are usually for duration of a few hours to a few days. Each request is analyzed on its own merits. Consideration is given to upstream watershed conditions, potential flood threat, conditions of lakes, and possible alternative measures. In the interest of maintaining good public relations, the request is complied with, providing there are no adverse effects on the overall project regulation for authorized project purposes. Approval for minor deviations will normally be obtained from the Jacksonville District by telephone. A written confirmation will be furnished after the deviation is completed. SAJ will report these deviations to SAD.

C. Planned Deviations. Each condition should be analyzed on its own merits. Sufficient data on flood potential, lake and watershed conditions, possible alternative measures, benefits to be expected, and probable effects on other authorized and useful purposes will be presented to the Jacksonville District along with recommendations for review and approval. SAJ will report these deviations to SAD and obtain approval.

7.19 Monitoring. Data will be collected to monitor flow rates and phosphorus removal rates within the STA. Inflow to the system will be determined by the manufacturer’s pump curves and head determined from water levels transmitted from sensors upstream of the pump station and at the discharge force main. A water level sensor on the upstream side of the separation levee will provide information on

the slope of the water surface across the site, an indirect indication of the resistance to flow and thus the degree of vegetation within the cell. A gate level sensor, monitored in conjunction with the water level sensors will provide information necessary to estimate discharge from Cell 1 to Cell 2. A similar arrangement of water and gate level sensors at the outfall of Cell 2 will enable estimation of total discharge. The three flow measurements, one at the inflow, one at the divider, and one at the discharge end of the STA, in conjunction with local rainfall measurements, will enable the district to determine quantities of water treated and combined losses from seepage and evapotranspiration. See Figure 3 for a map of the location of the sensors. Water Quality(WQ) number 1 and 2 are required permit monitoring.

Figure 3 - Nubbin Slough STA Monitoring Sites*



*Not to Scale